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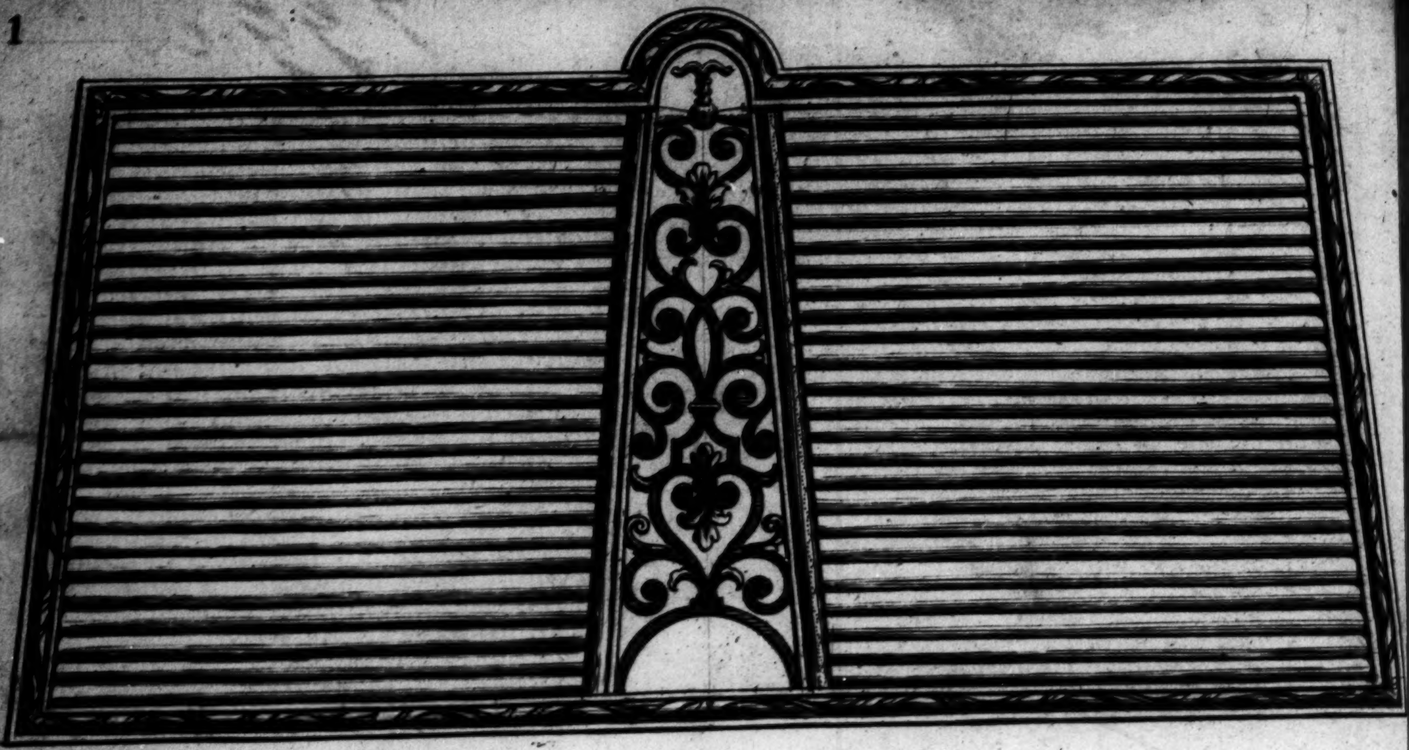

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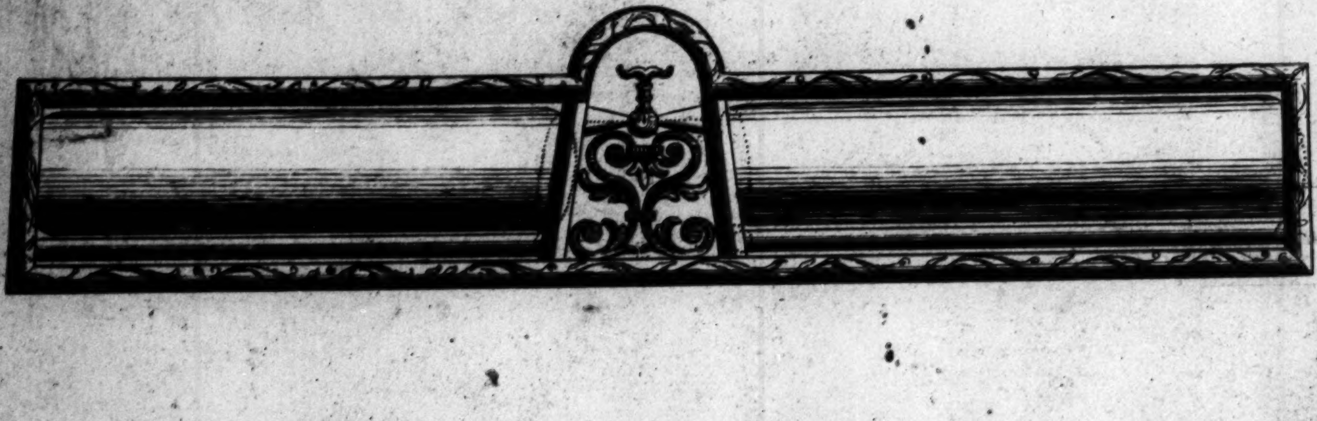

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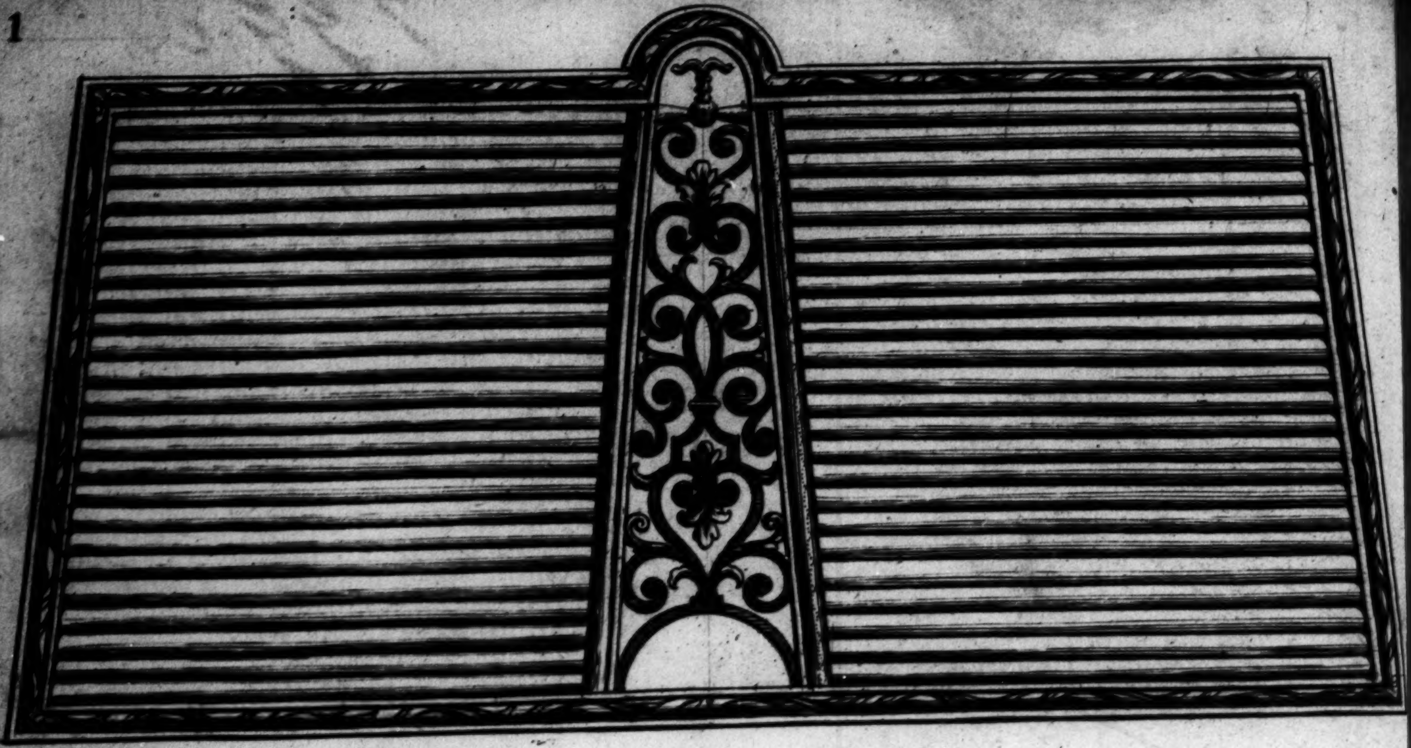

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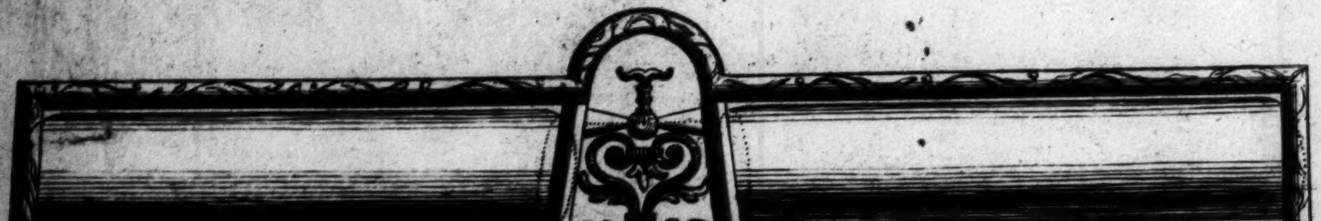

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AN
EXPLANATION
Of the NATURE of
EQUATION of TIME,
And USE of the
EQUATION TABLE
FOR
Adjuſting WATCHES and CLOCKS
TO THE
MOTION of the SUN.
ALSO
The Deſcription of a TIME-KEEPER, for Aſtronomical and other Uſes.

LONDON:
Printed for F. CLAY, at the *Bible*, without *Temple-Bar*.
M. DCC. XXXI.

[Price 1 *s*.]

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PREFACE.

WITHOUT underſtanding the Nature of Equation of Time, and Uſe of the Table, it is impoſſible to know whether a Watch or Clock goes right or wrong; it is impoſſible to ſet a Watch or Clock ſo as to keep any tolerable Correſpondence with the Sun; it is impoſſible to diſtinguiſh betwixt Good and Bad Workmanſhip of theſe Machines; or at any time to know the True Moment of Day or Night by the beſt Watch or Clock in the World.

Notwithſtanding this Knowledge is ſo abſolutely Neceſſary for regulating Time-Keepers, and making them Uſeful to Us, moſt Gentlemen, nay (which is more ſurpriſing) moſt Watch-makers in the Country *are intirely Strangers to it. The Reaſon of ſo general Ignorance in this Matter is, that the Buſineſs of Equation has been treated of only by Mathematicians and Aſtronomers, whoſe Deſcriptions are above the Reach of Common Readers.*

In the following Diſſertation I have endeavoured to explain this Myſtery in ſuch a Manner, that the moſt ordinary Capacity may eaſily apprehend what is meant by Equation of Time, and what the Uſe of the Equation-Table.

By this means Gentlemen not verſ'd in Aſtronomy and Mathematicks, will perfectly underſtand how to manage their Watches and Clocks, ſo that the exact Moment of Day or Night may at any time be diſcovered; which without this Aſſiſtance is always impoſſible to be known.

EQUATION of TIME

EXPLAINED.

WHOSOEVER examines a good Watch or Clock by the Sun-Dial, will obſerve that the Sun and his Watch or Clock are very ſeldom together; that when That happens, they continue ſo but a Day or two at moſt; that the Difference betwixt them proceeds not uniformly, but encreaſes or diminiſhes ſome Days more, others leſs; that this Diſagreement is various, ſometimes the Sun being a Quarter of an Hour before the Movements, at other times a Quarter behind them; and, that this Uncertainty is perpetual, never cured, be the Machines changed or altered ever ſo oft. The Perſon obſerving this, and not apprehending the Reaſon, will naturally conclude, that his Watch or Clock, whoſe

Motions are ſo ſtrangely inconſiſtent, muſt in ſome reſpect or other be faulty in its Compoſition: whereas all the while the Fault is only in the Ignorance of the Poſſeſſor. To account for theſe Varieties, and reconcile the Difference, ſhall be the Buſineſs of this preſent Treatiſe.

THE Interval of Time betwixt Twelve, One, Two, Three a-Clock, or any other Hour of Day or Night, to the ſame Hour the next Day or Night, is called, A NATURAL DAY *. This, with reſpect to Light and Darkneſs, is divided into two parts, *Day* and *Night*: the former betwixt Sun-Riſe and Sun-Set, the latter betwixt Sun-Set and Sun-Riſe.

The antient † *Jews* and *Romans*, as do the *Turks*, divided the Day (the Time betwixt Sun-Riſe and Sun-Set) into Twelve equal Parts, called *Hours*; and the Night into the ſame Number. Theſe Hours, as being each the twelfth Part of the Day or Night, are Longer or Shorter, according to the Seaſon of the Year. In Summer the Hours of the Day are Long, and thoſe of the Night Short; in Winter the contrary. As the Order of Hours begun to be reckoned,

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* It is called *Natural*, to diſtinguiſh it from that Signification of the word Day which is oppoſed to Night, and which is called the *Artificial* Day.

† John xi. 9. *Jeſus anſwered, Are there not Twelve Hours in the Day?*

reckoned, in the Day from Sun-Riſe, in the Night from Sun-Set, what we call Noon and Midnight were all the Year Six a-Clock with them, as being the middle Point betwixt Sun-Riſe and Sun-Set in the Day, and Sun-Set and Sun-Riſe in the Night. When Days and Nights are of the ſame Length, Seven a-Clock, according to our Method of Computation, both Morning and Evening, was their Firſt Hour or One a-Clock: Our Eight a-Clock anſwers to their ſecond Hour; our Nine to their Third *: ſo

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* *Matth.* XX. —*Houſeholder—went out early in the Morning to hire Labourers into his Vineyard. And he went out about the Third Hour, and ſaw others ſtanding idle,—and ſaid unto them, Go ye alſo into the Vineyard.—Again, about the Sixth and Ninth Hour, he did likewiſe. And about the Eleventh Hour he went out and found others, and ſaith unto them, Why ſtand ye here all the day idle?—When they came who were hired about the Eleventh Hour, they received every Man a Penny,—the firſt likewiſe received every Man a Penny——and murmured, ſaying, Theſe laſt have wrought but One Hour; and thou haſt made them equal to us who have born the Burden and Heat of the Day.* In this Paſſage the Third, the Sixth, the Ninth, and the Eleventh Hours are mentioned. The *Third* is the Middle betwixt Sun-Riſe and Mid-Day: which, when Days and Nights are equal, anſwers to Nine in the Morning by our Computation; but is before Nine when Days exceed the Nights in Length, and after Nine when Days are ſhorter than Nights. The *Sixth* Hour is Noon or Mid-Day. The *Ninth* Hour anſwers our Three in the Afternoon, when Days and Nights are equal; but is before or after Three, more or leſs, as Days are longer or ſhorter. The *Eleventh* was an Hour before Sun-Set: *Why ſtand ye here all the Day idle?* ſays He at the Eleventh Hour: there being but One Hour (longer or ſhorter according to the Time of the Year) to the Concluſion of the Day: And the Firſt ſaid, *Theſe Laſt have wrought but* One Hour.

ſo on thro' both Day and Night. At all other times of the Year their Hours varied from this Account, according to the Length and Shortneſs of Days and Nights.

In *England*, as in moſt other *European* Countries, the Natural Day is divided into two Parts, Morning and Evening: the former begins at Midnight, and ends at Noon; the latter begins at Noon, and ends at Midnight. Each of theſe is divided into Twelve equal Parts called *Hours*, which are nearly of the ſame Length all the Year: Each Hour is divided into Sixty equal Parts, called *Primes* or *Minutes*; each Minute into Sixty *Seconds*; theſe into other leſs ſubordinate Parts, to the ſmalleſt Diviſion or Portion of Time.

The following Characters uſually diſtinguiſh the Hour and its Subdiviſions, $h.\ {}^{\prime}\ {}^{\prime\prime}\ {}^{\prime\prime\prime}$; as $\overset{h.}{5}, \overset{\prime}{14}, \overset{\prime\prime}{34}, \overset{\prime\prime\prime}{57}$; to be read, 5 *Hours*, 14 *Minutes*, 34 *Seconds*, 57 *Thirds*.

If the Natural Days (as from Twelve, One, Two a-Clock, or any other Hour, to the ſame Hour next Day)

Matth. xxvii. 45. *From the Sixth Hour there was Darkneſs over all the Land unto the Ninth Hour:* that is, Half the Time betwixt Noon and Sun-Set.

Acts ii. 14, 15. *Peter ſtanding up ſaid,—Theſe Men are not drunk, as ye ſuppoſe, ſeeing it is but the Third Hour of the Day:* that is, the Mid-Time betwixt Sun-Riſe and Noon; the Hour for the Morning Sacrifice and Prayers; before the Celebration of which, the *Jews* ſeldom eat or drank, eſpecially on the Great Feſtivals, as was this of *Pentecoſt*.

Day) were of the ſame Length throughout the Year, a Watch once ſet right, and continuing its Revolutions of equal Length, would always keep Time exactly with the Sun: neither of them would loſe or gain of the other. But if the Sun varies in its Motion, ſo that the Natural Days become either longer or ſhorter than That by which the Watch was ſet, the Watch in time will differ ſo much from the Sun as is gained or loſt by the Sun's Motion.

And this is really the true Reaſon of the Difference betwixt the Sun and Watches. The Sun is always either gaining or loſing: no two Natural Days together in the whole Year are exactly of the ſame Length. A good Watch, whoſe Two Revolutions at any time are exactly equal to a Natural Day, muſt therefore in a little time ſenſibly vary from the ſame.

If then a Gentleman ſhould to-Day ſet his Watch with the Sun by the Dial, and in few Days find a Difference betwixt them; he muſt not immediately condemn his Watch as erroneous, for not keeping exactly with the Sun: but ought to be informed, that, if his Watch be really a good one, this Difference will neceſſarily happen. Twenty-four Hours of a good Watch are always exactly of the ſame Length; but Twenty-four Hours of the Sun are not exactly ſo: therefore it is impoſſible a good Watch and the Sun can always keep together.

The Sun is the true Meaſure and Standard of computed Time; not the Watch, tho' ever ſo exact. For Inſtance: If at any time Twenty-four Hours of the Watch are of the ſame Length as the Natural Day, or Twenty-four Hours of the Sun, but the following Natural Day is Five Minutes longer than the former, and the next Natural Day Five Minutes longer than the foregoing: In this Caſe it is not Twelve a-Clock when the Watch (ſet true at firſt, and continuing equal Periods ever ſince) exhibits Twelve a-Clock; but when the Sun comes to the South, and ſhews Twelve a-Clock by the Dial.

When the Sun is directly South of any Place, it is that Moment Mid-day or Twelve a-Clock at that Place. It is *Mid-day*; becauſe the Sun is then ſaid to be in the *Middle*, equally diſtant from his Riſing in the Eaſt and ſetting in the Weſt: It is Twelve a-Clock; as being the laſt Moment of the Twelve Hours (beginning at Midnight) into which the Morning by *Engliſh* Computation is divided: So Midnight is alſo Twelve a-Clock; as being the laſt Moment of the Twelve Hours (beginning at Noon) into which the Evening by like Cuſtom is divided.

Tho', for Brevity ſake, Watches only are mentioned in the following Pages, yet what is ſaid of them holds equally true in reſpect of Clocks alſo.

Suppoſe at Eleven a-Clock (the Sun and Watch going together) the Sun was to ſtand ſtill three Hours, but the Watch to continue its Motion regularly: In this Caſe it would not be Twelve a-Clock when the Watch ſhew'd that Hour; but when the Sun ſhould come to the South; at which time it would be Three a-Clock by the Watch.

The Sun then is the true Meaſure and Standard of Time: therefore Sun-Dials repreſent * True Time all the Year; but Watches do not, tho' ever ſo good and ſet exactly right.

It will here be reaſonably ask'd, of what Uſe are Clocks and Watches if they repreſent not true Time, tho' ſet ever ſo right, and continuing to go ever ſo exactly? I anſwer: Of the ſame Uſe as if they really repreſented true Time. The Increaſe and Decreaſe of Natural Days is regular. If then I know how much my Watch is too faſt or too ſlow, it is the ſame thing as if it pointed exactly right: becauſe by adding or ſubtracting the Difference, as Occaſion requires, true Time is thereby known. And this Difference is what the Tables of Equation exhibit: they inform us how much Watches are faſter or ſlower than the Sun every Day of the Year; by adding or ſubtracting which Difference, as the Table directs, true Time is thereby gained.

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* By True Time is meant the Hour of Day or Night, according to our *Engliſh* Computation.

October the tenth, by the Table I find that Watches are about 15′ or Quarter of an Hour too ſlow: therefore, when it is three Quarters paſt Eleven by the Watch that Day, it is Twelve a-Clock by the Sun. *February* the Eleventh, obſerving by my Watch that it is 14 Minutes paſt Eight a-Clock; and by the Table, that Watches that Day are about 14 Minutes too faſt, I thence know the true Time, which is Eight a-Clock.

By EQUATION then is meant the Difference of Time betwixt a good Watch and the Sun: which Difference added to, or ſubducted from, the Time of the Watch, brings it to an *Equality* with the Sun.

If Watches are ſet to thoſe Natural Days which are ſhorteſt, (that is, if Twenty-four Hours of the Watch are of the ſame Length as the ſhorteſt Natural Day) they will be, more or leſs, before the Sun all the reſt of the Year: And if they are ſet to the longeſt Natural Days, they will be ſlower than the Sun at all other times. In either of which Caſes, the Difference betwixt Watches and the Sun would ſometimes amount to half an Hour. But to avoid ſo wide a Difference, the Days of Mean or Middle Length, betwixt the longeſt and ſhorteſt, are thoſe to which Watches are moſt conveniently adjuſted: So that two Revolutions, or Twenty-four Hours of a Watch, are ſo much ſhorter than the longeſt

Natural

Natural Day, as they are Longer than the Shorteſt. By this means, at moſt, Watches and the Sun are little more than a Quarter of an Hour diſtant from each other.

From the foregoing Account the following Uſe and Advantages of an Equation-Table will plainly appear.

I. To prevent Gentlemen entertaining an ill Opinion of their Watches becauſe of their ſeemingly irregular Deviations from, and Diſagreement with, the Motion of the Sun. Whereas if the Watches be really Good, theſe Differences will neceſſarily happen: are therefore ſo far from being Symptoms of Bad Workmanſhip, that perhaps they are the very Characteriſticks of Good.

II. To prevent Gentlemen from ſpoiling their Watches by conſtantly altering them to reduce them to an Agreement with the Sun. We have ſo good an Opinion of the Sun that we are apt to fancy it can be guilty of no Miſtakes: that therefore, whatever Diſagreement happens betwixt the Dial and Watch, the Fault can only be chargeable on the latter. Influenced by this Prejudice in favour of the Sun, it is not to be thought abſurd that People endeavour to bring their Watches to an Agreement with it: and for this End are continually altering, not only the Hand, but alſo the Spring, to accommodate their Motion to that of the Sun. Whereas Watches are ſo far from gaining ſuch a Regularity as expected from this Management, that in order to keep Time exactly with the Sun, they muſt be altered every Day in the Year. Which, how detrimental that muſt be to the Workmanſhip, need not be mentioned.

III. By the Aſſiſtance of the Equation-Table the true Hour and Moment of Day or Night are exactly known; which the beſt Watch by it ſelf never repreſents exactly above Four Days in the whole Year. The Revolutions of good Watches (as before obſerv'd) are always of the ſame Length; but thoſe of the Sun are not ſo, but vary every Day from the foregoing: therefore the Sun and Watches cannot poſſibly keep long together. But the Sun is the Regulator and Standard of Time, not the Watch: and the Table repreſents the Difference betwixt them for every Day in the Year: by taking which into the Account true Time is always gained. Therefore, tho' Watches do not repreſent true Time, it is the ſame thing as if they really did: for if I know how much my Watch is before or after the Sun, which the Table diſcovers; by the Difference being added or ſubſtracted, as Occaſion requires, True Time is thereby exactly known.

IV. The Equation-Table is a Direction how to ſet Watches ſo that true Time may always be known. Tho' Watches be ever ſo good, yet unleſs they be ſet right, they can never diſcover True Time. To ſet them right is not to ſet them with the Sun, unleſs on Days when there is no Equation. If a Watch be ſet with the Sun, ſo as to exhibit True Time, *October* the Twenty-Third; the latter End of *January* following it will be half an Hour diſtant from Truth: and yet it's Motion have been perfectly exact and regular all the Time. When therefore a Watch is to be ſet, the Table is to be conſulted; and the Index placed ſo much before or after the Sun as the Table repreſents. By this means the Watch will continue to keep the Table-Diſtance from the Sun; which, added or ſubſtracted, gives the true Moment of Time.

'Tis true, the Sun only ſhews the Time of the Day; and by ſetting the Index different from the Dial I knowingly ſet my Watch perhaps a Quarter of an Hour too faſt or too ſlow: but then, by allowing the Equation, true Time both that Day and afterwards is as exactly known as the Dial it ſelf repreſents it: whereas if the Watch be ſet exactly with the Sun, (unleſs when there is no Equation) it will indeed keep Time with the Sun that Day, but vary from it every Day after. Neither is there any way of knowing how much a Watch, ſo ſet, gains or loſes of the Sun, as when ſet with Allowance of the Equation.

V. The Equation-Table is a Touch-Stone or Criterion by which the Goodneſs or Defect of Watches is evidently diſcovered. A Time-Keeper ſet according to the Direction of the Table, and continuing to keep the ſame Diſtance from the Sun as the Table each Day repreſents, may be depended on as true Workmanſhip in good Order. But if the Watch deviates from the Equation expreſs'd in the Table, it is either Faulty in its Compoſition, or, at that time out of Order.

P. S. In the foregoing Treatiſe, I have all along ſuppoſed that Watches and Clocks may be made ſo perfect, that their Revolutions ſhall always be exactly of the ſame Length: but after all, I am afraid there is no ſuch thing in Nature as Clocks or Watches intirely perfect. Heat and Cold, Moiſture and Dryneſs, ſenſibly influence theſe curious Machines: ſo that every ſmall Irregularity of their Motion is not to be imputed to a Flaw or Imperfection in the Work. However, as before advanc'd, as much as Watches and Clocks deviate from the Table-Diſtance, ſo far they differ from the Time they ought to exhibit.

I before obſerv'd that Sun-Dials repreſent the exact Time all the Year. This is true in a limited Senſe only: For the Refraction of the Sun-Beams (which is greater or leſs in Proportion, as the Sun is farther from, or nearer to the South) makes ſome ſmall Variation. But at Noon the Dial is exact all the Year. About Mid-day therefore is the proper Time for examining Watches by the Dial, and adjuſting them to the Motion of the Sun.

The USE of the Table is very obvious.

For gaining True Time.

January the Firſt, Watches are Eight Minutes Fifty Nine Seconds (nearly Nine Minutes) faſter than the Sun; which Nine Minutes being ſubducted from the Hour exhibited by the Watch, gives the true Time that Day: Therefore when the Watch points at Nine Minutes after Twelve a-Clock, it is then Twelve by the Day. *October* the Twenty-Fourth, Watches are Sixteen Minutes ſlower than the Sun: when therefore it is Twelve a-Clock by the Watch, it is Sixteen Minutes paſt Twelve by the Sun, which is the true Time of the Day.

For Setting Watches.

If a Watch is to be ſet *January* the Firſt, the Index is to be placed Eight Minutes Fifty-Nine Seconds (or about Nine Minutes) before the Sun: If on *October* the Twenty-Fourth, Fifteen Minutes after the Sun.

From theſe Inſtances, the Uſe of the Table for every Day in the Year, is plain and evident.

The

The DESCRIPTION of a TIME-KEEPER

For Aſtronomical and other Uſes.

THE Machine here propos'd (Figure I.) is in the Nature of an Hour-Glaſs, each Part conſiſting of a Row of Glaſs Tubes, whoſe cloſed Ends are fixed in a Frame of Braſs which goes round the Whole, and alſo by a Plate behind ſtrengthens the Back of it. The *Mercury*, the Fluid here uſed, deſcending thro' a ſmall Orifice in the Spark of a Diamond, fills firſt the Neareſt, next the Second, thence in order all the Tubes, whoſe Tops are in a declining Plane. A Stop-cock opens or cloſes up the Paſſage at pleaſure. Theſe Tubes, or ſmall Plates of Braſs in their Interſtices (not expreſs'd in the Figure) mark'd by *Obſervation*, ſhew both the Hour and intermediate Diviſions*. Little Time will be loſt in renewing the Motion, if this Machine turn on two Side-Centers in a Frame, like the Ladys'

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* The great Aſtronomer *Tycho Brahe* meaſur'd Time by the flowing of Quick-Silver; collecting the Length of Time by the Weight of the Mercury run out. *Progymn. Uraniburgi* MDCII. *p.* 149, 150.

Dreſſing-Glaſſes: or if two of theſe Inſtruments be made uſe of, one of which to be opened the Moment the other ceaſes to flow, the Inconvenience of ſudden Turning or Loſs of Time will effectually be avoided.

It may be objected: If the Bore of the Tubes be Large compar'd with the Orifice of Communication, the Riſe of the Mercury in the Tubes will be ſenſibly ſo ſlow that ſmall Portions of Time will not be diſtinguiſhable: and if ſmall, (not to mention the unwieldy Bulk of a Number of Tubes, neceſſary for any conſiderable Length of Time) the Trouble of exact Obſervations and repeated Experiments to compleat and perfect ſuch a Machine with frequent and true Diviſions, will be infinite.

The following Expedient remedies all Inconveniences.

Each Part of this Inſtrument may conſiſt (inſtead of 24 Tubes, as in the former) only of One Tube (*Figure* II.) a Foot long, of a large Bore, containing One, Twelve, or 24 Hours, a Week, a Month, or a Year of Quickſilver, leſs a Minute; and joined to this a ſmall Tube of the ſame Length to exhibite the remaining Minute. Very little Trouble of Obſervation and Experiment will be neceſſary to compleat ſuch a Machine: and by this means the Moment when the deſign'd Period ends will be diſcovered to the greateſt Accuracy. By

This leaf misplaced; see [illegible]

By an Inſtrument of this Nature, Watches and Clocks may be daily and hourly examined; and the leaſt Loſs or Gain exactly known.

Whether Watches and Clocks may not by this means be brought to keep a tolerably exact Account of Time during the longeſt Voyage, muſt be left to Experience.

By this Inſtrument That hitherto inexplicable Difficulty may perhaps at laſt be reſolved, whether Sidereal Days and Years, are reſpectively all of the ſame exact Length.

If we conſider how ſoft and yielding the Materials of Clocks and Watches are, whoſe Parts by long-continued Uſe muſt neceſſarily wear ſmooth and give way: if we reflect how impoſſible it is, that in ſo complex and intricate a Machine there ſhould not be the leaſt Flaw either in the Workmanſhip or Compoſition: if we alſo obſerve how theſe Movements are affected by different Degrees of Heat and Cold, Moiſt and Dry; and by Variety of other Accidents: —— All theſe Circumſtances too evidently demonſtrate, that Clocks and Watches are not to be depended on for the Reſolution of this curious Problem, ſo neceſſary in Aſtronomy, to be determined. Whether the Time-Keeper here propoſed, which, in appearance is not liable to any of theſe Inconveniences, is ſufficient for this purpoſe, Experience only can diſcover.

To divert the Reader's wearied Thoughts, I will cloſe this Tract with an ingenious Copy of Verſes from STRADA in the *Lacretian* Stile, not at all foreign from our preſent Subject.

Magneſi genus eſt lapidis mirabile, cui ſi
Corpora ferri plura ſtyloſve admoveris; inde
Non modò vim, motumque trahent, quo ſemper ad Urſam,
Quæ lucet vicina polo ſe vertere tentent:
Verùm etiam mira inter ſe ratione modoque
Quotquot eum lapidem tetigêre ſtyli, ſimul omnes
Conſpirare ſitum motumque videbis in unum.
Ut ſi fortè ex his aliquis Romæ moveatur,
Alter ad hunc motum, quamvis ſit diſſitus longè
Arcano ſe naturai fœdere vertat.
Ergo age, ſi quid ſcire voles, qui diſtat, amicum,
Ad quem nulla accedere poſſit epiſtola; ſume
Planum orbem patulumque, notas elementaque prima
Ordine, quo diſcunt pueri, deſcribe per oras
Extremas orbis: medioque repone jacentem,
Qui tetigit magneta, ſtylum; ut verſatilis inde
Litterulam quamcumque velis, contingere poſſit.

Hujus ad exemplum, ſimili fabricaveris orbem
Margine deſcriptum, munitumque indice ferri,
Ferri quod motum magnete accepit ab illo.
Hunc orbem diſceſſurus ſibi portet amicus,
Conveniatque priùs, quo tempore, queiſve diebus
Exploret, ſtylus an trepidet, quidve indice ſignet.
His ita compoſitis, ſi clàm cupis alloqui amicum,
Quem procul à tete terrai diſtinet ora;
Orbi adjunge manum, ferrum verſatile tracta:
Hic diſpoſta vides elementa in margine toto:
Queis opus eſt ad verba notis, huc dirige ferrum,
Litterulaſque, modò hanc, modò & illam cuſpide tange,
Dum ferrum per eas iterumque iterumque rotando,
Componas ſingillatim ſenſa omnia mentis.
Mira fides. longè qui diſtat cernit amicus
Nullius impulſu trepidare volubile ferrum,
Nunc huc, nunc illuc diſcurrere: conſcius hæret,
Obſervatque ſtyli ductum, ſequiturque legendo
Hinc atque hinc elementa, quibus in verba coactis
Quid ſit opus ſentit, ferroque interprete diſcit.
Quin etiam cùm ſtare ſtylum videt; ipſe viciſſim
Si quæ reſpondenda putat ſimili ratione

Litterulis variè tactis, reſcribit amico.
O utinam hæc ratio ſcribendi prodeat uſu!
Cautior, & citior properaret epiſtola, nullas
Latronum verita inſidias, fluvioſve morantes.
Ipſe ſuis Princeps manibus ſibi conficeret rem:
Nos ſoboles ſcribarum emerſi ex æquore nigro,
Conſecraremus calamum Magnetis ad oras.

The Meaning of theſe Lines is this: That the *Load-ſtone* has not only a Property of Pointing to the North, but has alſo another ſurpriſing Quality that may be of infinite Uſe to Mankind. Suppoſe the Letters of the Alphabet, inſtead of North, South, and other Points, inſcrib'd round the Edge of a Compaſs (if I may ſo call it) whoſe Needle plays freely on the Center. Let a Friend going abroad, carry with him one of thoſe Alphabetical Circles, whoſe Needle is touch'd with the ſame Stone as the Friend's who ſtays at home. At the Time agreed on, one of the Friends turns the Point of the Needle or Style to ſuch Letters ſucceſſively as are neceſſary to expreſs his Mind: and the Style of the other Compaſs, tho' ever ſo diſtant, turns in the ſame manner of its own accord to the ſame Letters. The Friend to which this other Compaſs belongs, obſerves the Motion of the Style; and takes down in Writing

Writing the Letters as it points to them. By this means he knows all that his Friend deſires to communicate to him: and in return points out ſuch Letters as expreſs his own Thoughts, which the other Friend takes down in like manner. Thus two Friends may converſe at the greateſt Diſtance: and may underſtand each other's Thoughts in a Moment, without Riſque of any other Perſon knowing what paſſes betwixt them.

To apply this to our preſent Subject concerning Time. Suppoſe the Point of the Index, or Finger at Saint *Paul's* Clock touch'd with a Magnet, and that Time-Compaſſes (that is, on whoſe outward Limb the Hours and Minutes are expreſs'd as on Dial-Plates of Clocks and Watches) with Styles touch'd with the ſame Magnet, and playing freely, were diſpers'd over all Countreys. By this Means the Movement at St. *Paul's* (with Allowance for Eaſt or Weſt Situation) would ſhew what a-Clock over the whole Earth; and anſwer the Uſe of all the Clocks and Watches now in the World.

It is pity this is no more than a pleaſing Amuſement, becauſe ſuch great Advantages would accrue from it. To mention only one more relating to our preſent Subject. By this *Time-Compaſs* the Seaman knows the Hour and Minute of the Day at *London*; and taking the local Time of the Place he is in, diſcovers the Difference betwixt the two Meridians; and thereby, with Addition of Latitude, aſcertains the exact Point of the wide Ocean he is that Moment in.

Who knows what Secrets in Nature Time may diſcover, that may anſwer this and many other uſeful Purpoſes!

FINIS.

BRITISH MUSEUM

A TABLE of EQUATION of NATURAL DAYS.

Days	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		Days
	Min.	Sec.	Min.	Sec.	Min.	Sec.	Min.	Sec.	Min.	Sec.	Min.	Sec.	Min.	Sec.	Min.	Sec.	Min.	Sec.	Min.	Sec.	Min.	Sec.	Min.	Sec.	
1	8′	59″	14′	48″	10′	08″	0′	48″	4′	07″	1′	03″	4′	43″	4′	30″	3′	48″	13′	14″	15′	23″	5′	42″	1
2	9	21	14	47	9	51	0	32	4	09	0	51	4	51	4	20	4	08	13	28	15	15	5	13	2
3	9	43	14	45	9	34	0	16	4	11	0	39	4	58	4	10	4	28	13	42	15	06	4	44	3
4	10	04	14	42	9	17	0	01	4	12	0	27	5	05	3	59	4	49	13	55	14	56	4	15	4
5	10	24	14	38	8	59	0	14	4	12	0	15	5	11	3	48	5	10	14	08	14	45	3	46	5
6	10	44	14	33	8	41	0	29	4	11	0	02	5	17	3	36	5	31	14	20	14	33	3	17	6
7	11	03	14	28	8	23	0	44	4	10	0	11	5	22	3	24	5	52	14	31	14	20	2	48	7
8	11	21	14	22	8	05	0	58	4	08	0	24	5	27	3	11	6	13	14	42	14	06	2	18	8
9	11	39	14	16	7	47	1	12	4	06	0	37	5	31	2	58	6	34	14	52	13	52	1	48	9
10	11	56	14	09	7	29	1	25	4	04	0	50	5	35	2	44	6	54	15	02	13	37	1	18	10
11	12	12	14	01	7	11	1	38	4	01	1	03	5	38	2	30	7	14	15	11	13	21	0	48	11
12	12	28	13	53	6	53	1	50	3	57	1	16	5	41	2	16	7	34	15	19	13	04	0	18	12
13	12	43	13	44	6	35	2	02	3	52	1	29	5	43	2	01	7	54	15	26	12	47	0	12	13
14	12	57	13	34	6	16	2	14	3	47	1	42	5	45	1	46	8	14	15	32	12	28	0	42	14
15	13	10	13	24	5	57	2	25	3	41	1	54	5	46	1	30	8	34	15	38	12	09	1	12	15
16	13	22	13	13	5	38	2	36	3	35	2	06	5	46	1	13	8	54	15	43	11	50	1	42	16
17	13	34	13	02	5	19	2	46	3	29	2	18	5	45	0	57	9	14	15	48	11	30	2	11	17
18	13	45	12	50	5	00	2	56	3	22	2	30	5	44	0	40	9	33	15	52	11	09	2	40	18
19	13	55	12	38	4	41	3	05	3	15	2	42	5	42	0	25	9	52	15	55	10	47	3	09	19
20	14	04	12	25	4	22	3	13	3	07	2	54	5	40	0	05	10	11	15	58	10	25	3	38	20
21	14	12	12	12	4	03	3	21	2	58	3	05	5	38	0	13	10	30	16	00	10	02	4	07	21
22	14	19	11	59	3	44	3	28	2	49	3	16	5	35	0	31	10	48	16	01	9	38	4	35	22
23	14	25	11	43	3	25	3	35	2	40	3	27	5	31	0	50	11	06	16	01	9	14	5	03	23
24	14	31	11	28	3	07	3	41	2	30	3	38	5	27	1	09	11	24	16	00	8	49	5	30	24
25	14	36	11	13	2	49	3	46	2	20	3	49	5	22	1	28	11	41	15	58	8	24	5	57	25
26	14	40	10	57	2	31	3	51	2	10	3	59	5	16	1	48	11	58	15	56	7	58	6	24	26
27	14	43	10	41	2	13	3	55	2	00	4	09	5	10	2	08	12	14	15	53	7	32	6	50	27
28	14	46	10	25	1	55	3	59	1	49	4	18	5	03	2	28	12	30	15	49	7	05	7	16	28
29	14	48	…….	…….	1	38	4	02	1	38	4	27	4	56	2	48	12	45	15	44	6	38	7	41	29
30	14	49	…….	…….	1	21	4	05	1	27	4	35	4	48	3	08	13	00	15	38	6	10	8	05	30
31	14	49			1	04			1	15			4	39	3	28			15	31			8	29	31

The **Black** *Figures* expreſs how much Watches and Clocks are *too Faſt*: The **Red** *Figures* how much *too Slow.*